NOTES ICHTYOLOGIQUES

NEW NORTHERN LIMIT FOR THE DISTRIBUTION OF *BROTULOTAENIA BREVICAUDA* (OPHIDIIFORMES, OPHIDIIDAE) AND *PSEUDOSCOPELUS SCRIPTUS* (PERCIFORMES, CHIASMODONTIDAE) IN THE ATLANTIC.

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RÉSUMÉ. - *Brotulotaenia brevicauda* Cohen, 1974 et *Pseudoscopelus scriptus* Lütken, 1892, sont signalées pour la première fois au large du Cap Flemish (Atlantique Nord-Ouest), ce qui augmente considérablement l'aire de distribution de ces deux espèces. L'éventuelle relation entre la présence inhabituelle de ces espèces et les conditions océanographiques anormales est discutée.

Key-words. - Ophidiidae, *Brotulotaenia brevicauda*, Chiasmodontidae, *Pseudoscopelus scriptus*, ANW, Flemish Cap, Distribution.

The genus *Brotulotaenia* Parr, 1933 and *Pseudoscopelus* Lütken, 1892 have a tropical and subtropical mesopelagic distribution (Cohen, 1974; Johnson and Keene, 1986). The appearance of *Brotulotaenia brevicauda* and *Pseudoscopelus scriptus* in the area of Flemish Cap bank is an unusual occurrence taking into account its latitude and the oceanographic conditions of its water masses. Flemish Cap is a bank located east of Newfoundland Grand Bank centered at about 47°N, 45°W with a diameter of about 200 km. The water mass over this bank is a mixture of Labrador Current and North Atlantic Current waters with a general anticyclonic circulation pattern (Colbourne, 1997).

The scarcity of references to these two species in the literature indicates the poor knowledge of their distribution and highlights some taxonomic uncertainties. This paper analyses the unusual occurrence of both species in these water masses, which is a noteworthy extension to their distribution ranges in the Atlantic.

Materials and methods

The specimens were caught during a fishing survey in July 1997 by the oceanographic vessel "Cornide de Saavedra". The two species were found by chance during the stomach content analysis made routinely during the annual European Union bottom-trawl survey on Flemish Cap.

Both specimens were found in the stomach of two species commonly caught in the area, the roughhead grenadier (*Macrourus berglax* Lacepède, 1801) and the spotted wolf-fish (*Anarhichas minor* Olafsen, 1772). For the capture of these predators, a "Lofoten" bottom trawl net of 35 mm mesh size was used. Temperature and salinity were recorded at the end of each haul.

Specimens were identified and preserved in 70% ethanol. Measurements were made with calipers and truncated to the lower whole mm. For *Pseudoscopelus scriptus*, measurements were made according to Norman (1929) and Parr (1933), and for *Brotulotaenia brevicauda* according to Cohen (1974).

The specimens are stored in the fishes collection of Instituto Español de Oceanografía de Vigo (IEOV).

Results

Brotulotaenia brevicauda Cohen, 1974

Material examined. - IEOV 11297, one specimen, 266 mm TL (Fig. 1), found on 17 July 1997 among the stomach contents of a *Macrourus berglax* female, 24 cm anal-fin length, captured at 47°12'N, 43°45'W, 645 m depth. Temperature and salinity at 518 m were 3.43°C and 34.84 psu.

Description. - Body compressed and elongated, but less than in other species of the genus; maximum body depth just behind the head before diminishing sharply; dorsal and anal fins long and low, joining to the caudal fin, without hard rays; short pectoral fin with rays free distally mounted on a short muscular base; ventral fin absent; teeth present on premaxillary, vomer, dentary and palatine; jaw teeth sharp-pointed, slightly curved, in a single row; gill rakers on first arch represented by stout tubercles with 1 to 4 teeth; anterior nostril well above upper lip; and colour of head and body black. Biometric and meristic characters are indicated in table I.

Distribution. - One specimen was reported from the temperate eastern N. Atlantic (NW of Spain) and about 10 specimens from tropical waters of Atlantic (Bermuda, Gulf of Mexico, Caribbean and mid-Atlantic), between the surface and 2,650 m (Cohen, 1974; Nielsen, 1986).

ERRATUM, *Cybium* 1999, 23(2), pp. 190 & 191.

Dear subscriber,

A mistake has occurred in the last issue of *Cybium* 1999, 23(2), pp. 190 & 191, article by Bañon *et al.* on *Pseudoscopelus scriptus* and *Brotulotaenia brevicauda.*

The drawings on pages 190 & 191 have been transposed. The drawing on page 190 corresponds to Pseudoscolepus (legend on page 191) and vice-versa, the drawing on page 191 is *Brotulotaenia.*

I apologise for this mistake and ask you to correct that on your issue.

The Editor

Please find below copies of the legends if you want to glue them at their appropriate location (fig. 1 on page 191; fig. 2 on page 190):

Fig. 1. - *Brotulotaenia brevicauda*, 266 mm TL (IEOV 11297).

Fig. 2. - *Pseudoscopelus scriptus*, 146 mm TL (IEOV 11397).

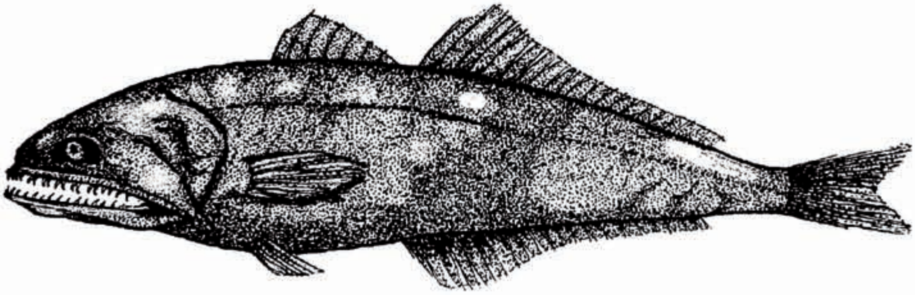

Fig. 1. - *Brotulotaenia brevicauda*, 266 mm TL (IEOV 11297).

Pseudoscopelus scriptus Lütken, 1892

Material examined. - IEOV 11397, one specimen, 146 mm TL (Fig. 2) found on 21 July 1997 among the stomach contents of an *Anarhichas minor* female, 65 cm TL, captured at 48°08'N, 45°15'W, 406 m depth. Temperature and salinity at 373 m were 3.48°C and 34.85 psu.

Description. - Body moderate by compressed and elongated, scaleless; head and body with rows of minute pores; big head; snout short, broad and rounded, with an apical portion of premaxillary emarginate; lower jaw scarcely projecting; maxillary extending nearly to angle of preoperculum; upper jaw teeth arranged in a band of two rows tapering to a uniserial row on posterior portion and with 4 depressible and larger teeth inward in the anterior portion; apical emargination with a group of 6 recurved fang-like teeth and one inward larger; lower jaw with two series, those of the inner row being the longest; palatines teeth in

	L (mm)	% SL
Biometry		
Total length	266	
Standard length	248	
Preanal length	120	48.4
Predorsal length	60	24.2
Head length	72	29.0
Eye diameter (horizontal)	10	4.0
Snout length	22	8.9
Upper jaw length	38	15.3
Interorbital width	20	8.0
Pectoral fin length	18	7.2
Body depth (vent)	31	12.5
Body depth (maximum)	53	21.4
Meristics		
Branchiostegal rays	7	
Teeth, vomer	2	
Teeth, palatine	9	
Teeth, dentary	20	
Teeth, premaxillary	24	
First gill arch rackers	2+1+11	
Dorsal fin rays	± 81	
Anal fin rays	57	
Pectoral fin rays	21	

Table I. - Biometry and meristic characters of *Brotulotaenia brevicauda*, 266 mm TL (IEOV 11297).

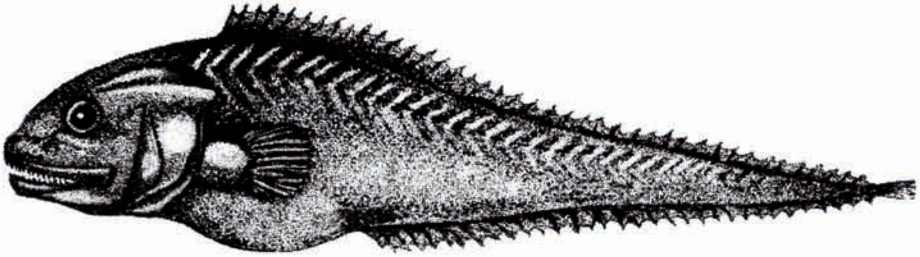

Fig. 2. - *Pseudoscopelus scriptus*, 146 mm TL (IEOV 11397).

a single series; vomer toothless; two dorsal fins, the first short, the second as long as the anal; the longest ray in the second dorsal less than 2/3 as long as longest spine in first dorsal; gill rakers absent, replaced by numerous, short, thin filaments, about 13+17; and colour of head and body brown with dark cross bands. Meristic and biometric characters are presented in table II.

Distribution. - Little known; cited for the tropical African Atlantic (Blache *et al.*, 1970) and from Northwest Atlantic in Old Bahama Straits (Lütken, 1892), Caribbean sea (Parr, 1933) and Corner rising (Vinnichenko, 1997).

	L (mm)	% SL
Biometry		
Total length.	146	
Standard length	125	
Preanal length	70	56.0
Pre- 1st dorsal length	49	39.2
Pre- 2nd dorsal length	65	52.0
Head length	39	31.2
Eye diameter (transversal)	4	3.2
Eye diameter (horizontal)	6	4.8
Preorbital length	9	7.2
Postorbital length	22	17.6
Upper jaw length	32	25.6
Interorbital width	14	11.2
1st dorsal base length	13	10.4
2nd dorsal base length	50	40.0
Anal base length	45	36.0
Pectoral fin length	23	18.4
Ventral fin length	8	6.4
Body width	17	13.6
Body depth (maximum)	29	23.2
Longest spine in 1st dorsal	10	8.0
Longest ray in 2nd dorsal	13	10.4
Meristics		
Dorsal fin rays	VII+22	
Anal fin rays	I+21	
Pectoral fin rays	14	
Ventral fin rays	I+5	

Table II. - Biometry and meristic characters of *Pseudoscopelus scriptus*, 146 mm TL (IEOV 11397).

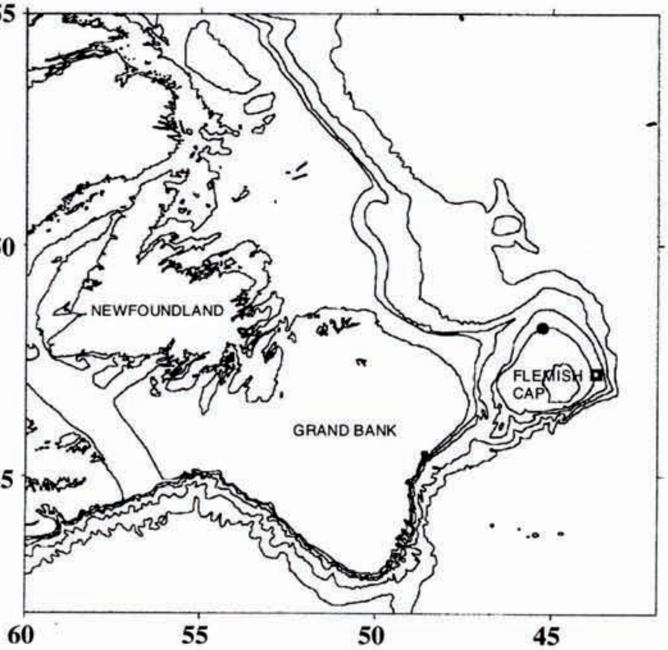

Fig. 3. - Area and stations where specimens of *Brotulotaenia brevicauda* and *Pseudoscopelus scriptus* were captured.

Discussion

The study of fish stomach contents provides information in addition to the identity of the predator. It also indicates the environment in which the predator lives, turning the predator into a sampler of species which are inaccessible to the fishing gear. The capture of species whose habits make their sampling difficult by any other method is common in stomach contents. However, in most cases the state of digestion of prey makes their identification difficult. The two specimens described in this paper were in a good state of conservation, as they had been recently ingested and therefore protected from any damage which might have been caused by the fishing gear. The opacity of the ocular globes and the colour of the gills allowed us to determine whether the prey has been ingested recently or not.

The disposition of the teeth of the specimen of *P. scriptus* does not coincide with previous descriptions (Lütken, 1892; Parr 1933). The specimen described here has neither the outer row of minute, decurved and fixed teeth in a single series, nor the inner group of three series of long decurved fangs. However, a very few number of specimens of *P. scriptus* have been described until now, so no conclusion can be made about these differences. The genus *Pseudoscopelus* needs a revision.

The presence of these two tropical species off Flemish Cap was unexpected. Flemish Cap is bordered by two major current systems (Templeman, 1976; Hayes *et al.*, 1977). The Labrador Current transports cold low-salinity water towards the south through Flemish Pass and along the eastern edge of Grand Bank. One branch of this current drifts eastward and later southeastward around the north and northeastern slopes of Flemish Cap. The North Atlantic Current of warm high-salinity water, flows towards the E and NE near the southern slope of Flemish Cap. Akenhead (1986) affirms that the water on the bank comes exclusively from the Labrador Current, although Hayes *et al.* (1977) state that the water is essentially a mixture of the water from the two currents, and Colbourne (1997) considers the influence of the northward flowing water of the North Atlantic Current east of the Cap to be evident. Cerviño and Prego (1997) find warmer and higher salinity deep water (200-300 m) than that of the surrounding water in the southeast of the bank. The origin of these slope waters would be in the interaction between the Gulf Stream rings and Newfoundland shelf waters (Drinkwater, 1996).

Kudlo *et al.* (1984) describe the anticyclonic gyre as being the prevailing form of water circulation on the bank; destruction of the gyre by the passage of frequent storms results in a meandering flow across the bank. In July 1997, geostrophic currents indicate a much weaker anticyclonic gyre than the 1996 results (Colbourne, 1997), resulting from an atmospheric cyclone passing over the region during the 1997 survey.

The unusual occurrence of these two species may be related to anomalous oceanographic conditions. The influence of hydrographic conditions of the Northwest Atlantic on the changes in distribution of the stocks supporting the commercial fisheries has been clearly described by many authors (Chumakov and Savvatimsky, 1990; Deyoung and Rose 1993; Sigaev, 1994). Off Flemish Cap, Frank *et al.* (1996) relate the unusual abundance of capelin (*Mallotus villosus*) to these anomalies. Similarly, Cerviño and Prego (1997) relate the distribution of *Sebastes marinus* and *S. fasciatus* to the entrance of warmer, deeper water (200-300 m) of higher salinity in the southeast of the bank.

The morphology of both species makes them poor swimmers, and thus their dispersion may be mainly due to the Gulf current, which would exert an important influence on the spread of tropical species towards the north in the west Atlantic. Ebeling (1967) pointed out that many equatorial species have a poleward component of their distributions, correlated with poleward deep intrusions of deep equatorial water along the continental shelf. This appears to be the case in *Kali normani* in the eastern Pacific (Johnson, 1969).

Following this hypothesis, their presence off Flemish Cap would be indicative of a greater influence of this current due to oceanographic anomalies in the area. Thus, both the North Atlantic Current interface with the Labrador Current, which brings about a complex system of meanders, extrusions and eddies that change rapidly in time and space in deep waters (Krauss *et al.*, 1987), and the variations in the pattern of circulation of Flemish Cap due to important atmospheric phenomena would explain the presence of these species.

The presence of other species of tropical character in the Corner rising seamount (34-37°N, 47-53°W) (Vinnichenko, 1997) and the find of another tropical species, *Sternoptyx pseudobscura*, off Flemish Cap (Zamarro and Lloris, 1991) support our hypothesis.

Acknowledgements. - We wish to thank Mikel Casas and Santi Cerviño for their valuable comments and advices. This study was supported by the European Commission (DG XIV, Study 96-030), Instituto Español de Oceanografia, Consejo Superior de Investigaciones Cientificas, Instituto Portugues de Investigaçao Maritima and the Basque Goverment.

REFERENCES

AKENHEAD S.A., 1986. - Water retention over Flemish Cap. *In:* The Role of Freshwater Outflow in coastal marine Ecosystems (Skreslet S., ed.). *NATO Adv. Sci. Inst. Ser.*, vol G7: 283-293.

BLACHE J., CADENAT J. & A. STAUCH, 1970. - Clés de Détermination des Poissons de Mer signalés dans l'Atlantique oriental (entre le 20e Parallèle N et le 15e Parallèle S). Faune Tropicale, 18: 479 p. Paris: ORSTOM.

CERVIÑO S. & R. PREGO, 1997. - Hydrographic conditions on the Flemish Cap in July 1996. *NAFO SCR Doc.*, 17, Serial n°N2847: 13 p.

CHUMAKOV A.K. & P.I. SAVVATIMSKY, 1990. - Distribution of Greenland halibut (*Reinhardtius hippoglossoides*) and roundnose grenadier (*Coryphaenoides rupestris*) in the northwest Atlantic in relation to hydrographic conditions in 1968-86. *NAFO Sci. Count. Stud.*, 14: 51-65.

COHEN D.M., 1974. - A review of the pelagic ophidoid fish genus *Brotulotaenia* with descriptions of two new species. *Zool. J. Linn. Soc.*, 55: 119-149.

COLBOURNE E., 1997. - Oceanographic conditions on the Flemish cap during the summer of 1997, with comparisons to the previous year and the 1961-1990 average. *NAFO SCR Doc.*, 84, Serial n°N2930: 15 p.

DEYOUNG B. & G.A. ROSE, 1993. - On recruitment and distribution of Atlantic cod (*Gadus morhua*) off Newfoundland. *Can. J. Fish. Aquat. Sci.*, 50: 2729-2741.

DRINKWATER K.F., 1996. - Climate and oceanographic variability in the northwest Atlantic during the 1980s and early 1990s. *NAFO Sci. Count. Stud.*, 24: 7-27.

EBELING A.W., 1967. - Zoogeography of tropical deep-sea animals. *Stud. Trop. Oceanogr., Miami*, 5: 593-613.

FRANK K.T., CARSCADDEN J.E. & J.E. SIMON, 1996. - Recent excursions of capelin (*Mallotus villosus*) to the Scotian Shelf and Flemish Cap during anomalous hydrographic conditions. *Can. J. Fish. Aquat. Sci.*, 53: 1473-1486.

HAYES R.M., MOUNTAIN D.G. & T.S. WOLFORD, 1977. - Physical oceanography and the abiotic influence on cod recruitment in the Flemish Cap region. *ICNAF Res. Doc.*, 62, Serial No. 5107: 33 p.

JOHNSON R.K, 1969. - A review of the fish genus *Kali* (Perciformes: Chiasmodontidae). *Copeia*, 1969(2): 386-391.

JOHNSON R.K. & M.J. KEENE, 1986. - *Pseudoscopelus*. *In:* Fishes of the North-eastern Atlantic and the Mediterranean, Vol II (Whitehead P.J.P., Bauchot M.-L,. Hureau J.-C., Nielsen J. & E. Tortonese, eds), pp. 960-961. Paris: UNESCO.

KRAUSS W., FAHRBACH E., AITSAM A., ELKEN J. & P. KOSKE, 1987. - The north Atlantic current and its associated eddy field southeast of Flemish Cap. *Deep-Sea Res.*, 34: 1163-1185.

KUDLO B.P., BOROVKOV V.A. & N.G. SAPRONETSKAYA, 1984. - Water circulation patterns on the Flemish Cap from observations in 1977-82. *NAFO Sci. Count. Stud.*, 7: 27-37.

LÜTKEN C.F., 1892. - *Pseudoscopelus*. Spolia atlantica. *Vid. Selsk. Skr. Naturv. Og. Math. Afd.*, VII(6): 284-285.

NIELSEN J.G., 1986. - Ophidiidae. *In:* Fishes of the North-eastern Atlantic and the Mediterranean, Vol III (Whitehead P.J.P., Bauchot M.-L,. Hureau J.-C., Nielsen J. & E. Tortonese, eds), pp. 1158-1166. Paris: UNESCO.

NORMAN J.R., 1929. - The teleostean fishes of the family Chiasmodontidae. *Ann. Mag. nat. Hist.*, 10(3): 529-544.

PARR A.E., 1933. - Genus *Pseudoscopelus* Lütken 1892. *In:* Deep Sea Berycomorphi and Percomorphi from the Waters around the Bahama and Bermuda Islands. *Bull. Bingham Oceanogr. Coll.*, 3(6): 36-42.

SIGAEV I.K., 1994. - Ecological conditions of silver hake concentration on the Scotian Shelf area. *NAFO Sci. Count. Stud.*, 24: 109-124.

TEMPLEMAN W., 1976. - Biological and oceanographic background of Flemish Cap as an area for research on the reasons for year-class success and failure in cod and redfish. *ICNAF Res. Bull.*, 12: 91-117.

VINNICHENKO V.I., 1997. - Russian investigations and deep water fishery on the Corner rising seamount in subarea 6. *NAFO Sci. Count. Stud.*, 30: 41-49.

ZAMARRO J. & D. LLORIS, 1991. - New northern limit for the distribution of *Sternoptyx pseudobscura* Baird, 1971 (Pisces: Sternoptychidae) in the Atlantic. *Sci. Mar.*, 55(2): 463-466.

Reçu le 28.06.1998.
Accepté pour publication 31.03.1999.